one DS0 on the switch per assigned channel units at the RT. This is possible because, statistically, a large portion of served customers are not actually using their service at any given time. Related capabilities allow the GR-303 interface to accommodate integrated BRI lines.

Because the GR-303 interface group defines a dynamic (instead of dedicated) relationship between DS0 switch ports and RT channel units, it cannot be managed with the same OSS used for copper feeder and TR-008 loops. It was necessary to define a new set of OSS capabilities and operational methods to support GR-303 IDLC. GR-303 IDLC also requires a new type of digital switch port. Thus, the huge existing investment in modern digital switch ports that support TR-008 IDLC would have to be replaced and stranded to deploy the GR-303 interface widely.

Q. **Has Verizon VA deployed the GR-303 interfaces in its network?**

A. No. Although GR-303 provides potential cost benefits as a result of the concentration feature described above, these benefits are offset by the very high cost of deploying the new OSS functionality and digital switch ports required to support GR-303. For these reasons, the industry has implemented GR-303 only on a very limited basis, and Verizon VA has not implemented it at all in its existing network.

Q. **Which of the two COT interfaces — integrated or universal — would be**

used in designing an efficient, forward-looking network?

A. Both would be used, depending on the application. Fiber-fed DLC switched services are provisioned using IDLC in the forward-looking model. UDLC or all-copper facilities must be used to provide other services such as individual two-wire unbundled analog loops, private non-switched services, payphone services, data services like ISDN and DDS, and others.

Q. Why would UDLC be necessary to provide access to an unbundled loop?

A. In order to access a single UNE loop, a physical point of interconnection is needed. As noted above, in a TR-008 IDLC configuration, digital interface ports on digital circuit switches are provided in groups of 24 DS0 channels called DS1s. Once multiplexed at the RT, the individual, dedicated DS0 channels remain grouped in a 24-channel DS1 format all the way to the digital interface ports on the switch. TR-008 equipment and software does not contain the operational capability to break the electronic connection between the individual channel units and the associated switch ports. Because IDLC delivers signals directly to the switch in a multiplexed DS1 format, IDLC does not allow CLECs to connect to individual loops (such as through a physical two-wire connection), and UDLC or copper cable must be used instead. Thus, based on currently available technology, to unbundle a loop from a TR-008 IDLC assignment, the distribution subloop must be physically reconnected to a different RT channel unit associated with a

UDLC interface, or the entire loop must be rearranged to a copper or UDLC loop. In operating practice, the whole loop rearrangement is the preferred method, since it avoids wiring work in the FDI.

Though it is hypothetically possible to support unbundling of individual loops using the GR-303 IDLC interface, the technology necessary to support such unbundling is not presently available. The GR-303 interface allows RTs to rearrange DS0 connection for an RT channel from one GR-303 DS1 group to another. In theory, one of the GR-303 groups could belong to a CLEC, thus permitting the CLEC to gain access to an individual RT channel. However, this feature would require developing industry standards for OSS and other technical interfaces to support a multi-user environment. It also would require RT suppliers to develop security, error-protection, and other operational capabilities necessary to support multiple users. To date, no such standards or capabilities have been developed, and Verizon VA is unaware of any efforts by the suppliers of OSS, RT and COT equipment to develop or make such functionality available. Thus, it is not possible, based on presently-available technology, to unbundle individual loops that are served with a GR-303 IDLC interface.

Q. Are there still circumstances in which it is more cost-effective to deploy an all-copper loop?

A. Yes. Where customers are located close to the central office, an all-copper solution often will be economically more efficient than fiber-fed DLC. On these shorter routes, it is not necessary to use the costly network add-ons (*e.g.*, heavier gauge cables, load coils, repeaters) used on longer copper loops, and using copper cables on these shorter loops also eliminates the costly outside enclosures that must be installed with fiber-fed facilities.

b) Development of forward-looking assumptions about loop architecture

Q. How does Verizon's current network compare to a forward-looking network?

A. In a forward-looking network, the long-term objective is to work towards a predominantly fiber-fed DLC network, reducing the copper cable length to the customer. Nevertheless, as just described, copper cables are and will continue to be the economically efficient design choice for many feeder loops serving customers located closest to the serving wire center. Thus, the forward-looking network would still have copper loops but would have an increased percentage of fiber-fed DLC loops. Presently, Verizon VA's network utilizes a mix of all-copper and fiber-fed loops, but because much of Verizon VA's network was built before the development of optical DLC technology, the large majority of Verizon VA's loops use all-copper feeder. Verizon VA does place most new feeder capacity using fiber-fed DLC, however, so the percentage of optical fiber feeder facilities should slowly increase over time.

Q. Describe the loop architecture utilized in the forward-looking network assumed for the recurring studies.

A. Verizon VA's forward-looking network includes a combination of 1) fiber-fed DLC with copper sub-feeder and distribution cables, 2) fiber cable to a building, and 3) all-copper feeder and distribution loops. To make Verizon VA's study forward-looking, it was necessary to develop realistic assumptions about the relative percentages of loops that would be constructed using each type of facility, without regard to the mix of facilities currently in service with Verizon VA's network. Verizon VA's study assumed that all-copper loops would be used to serve only customers closer to the central office and that fiber-fed DLC would be used for longer loops. Thus, Verizon VA's combined design strategy (copper and fiber) reflects the cost-effectiveness of all-copper loops on many shorter routes while eliminating costly network components required for longer copper loop designs (*e.g.*, heavier gauge cables, load coils, repeaters).

In addition, Verizon VA's loop study further recognizes that, for shorter loops with a large number of customers at a single location, it is more efficient to use fiber-fed DLC instead of copper feeder facilities. Consistent with forward-looking economics, the cost studies therefore assume a fiber-to-the-building loop architecture for all locations having a demand greater than 150 lines.

Q. How did Verizon VA determine the point at which it would be economically efficient to use optical DLC feeder facilities?

A. When calculating the forward-looking cost of the loops in a wire center, Verizon VA's Loop Cost Analysis Model (LCAM) (see Cost Manual, Attachment B) uses a designated breakpoint to determine whether all-copper feeder cable or a combination of fiber-fed DLC and copper should be calculated. The copper/fiber breakpoint is a measurement in feet or kilofeet (kf) of feeder cable where it would be more economical to install fiber feeder cables instead of copper feeder cables. Verizon VA performed cost calculations at various feeder lengths through the LCAM model to determine the lowest cost of installing all-copper versus optical DLC feeder facilities. Verizon VA used these calculations to determine the feeder length beyond which it would be efficient to install optical DLC feeder facilities.

Q. What was the result of Verizon VA's analysis of the copper/fiber breakpoint?

A. The results of the LCAM breakpoint calculations are summarized in Attachment D to this testimony. As these results show, Verizon VA's sensitivity analysis demonstrated an immaterial difference in cost between the fiber and copper alternatives in the range of three kf to five kf of feeder cable. Verizon VA selected the middle of this range, four kf, as the economic breakpoint for Virginia feeder. When this breakpoint was applied to all of the loops served by Verizon VA and the loops serving highly concentrated customer locations were taken into account, Verizon VA calculated that, in the most efficient forward-looking network, 17.7% of Verizon VA's loops would be all copper, and the remaining 82.3% of the loops would be fiber-fed DLC. Among the fiber-fed DLC loops, Verizon VA further assumed that 30% would be UDLC and 70% would be IDLC, with the result that 24.7% of all loops would use UDLC and 57.6% would use IDLC. As an aggressive forward-looking assumption, Verizon VA then assumed that 10% of all loops would be served via GR-303 interfaces.

Q. How was the percentage of loops on IDLC versus UDLC determined for the forward-looking network?

A. The percentage of loops using IDLC versus UDLC was determined by developing a forward-looking assumption based on Verizon VA's experience deploying these technologies in the current network. Because of the need to support unbundled loops and private lines (non-switched services), Verizon VA has found it necessary to install UDLC for approximately 30% of the fiber-fed loops on which DLC has been installed in the last three years. Verizon continues to install UDLC because, as explained above, UDLC is necessary to provision certain services, among them the two-wire analog unbundled loop connected to a CLEC collocation arrangement. Thus, in a forward-looking network in which Verizon continues to have obligations under § 251 of the Telecommunications Act, Verizon VA would have to maintain a share of UDLC and could not install an all-IDLC network.

In the remaining 70% of fiber DLC installations in the past three years, Verizon VA has been able to use IDLC. Verizon VA's actual deployment of this forward-looking technology when replacing or building new facilities was used as a basis for estimating the make-up of the network at the end of the forward-looking planning period. Verizon VA assumed that the entire forward-looking network would be comprised of the efficient mix reflected by the mix of technologies it expects to continue to deploy over the planning period.

Q. Is there any reason to believe that the need for UDLC will decrease in the foreseeable future?

A. No. In fact, Verizon VA expects that the need for UDLC could actually increase as the demand for non-switched data services increases. In any event, there is no indication that UDLC will not be needed to unbundle loops efficiently at any time in the foreseeable future.

Q. How was the percentage of loops using TR-008 versus GR-303 determined?

A. As discussed, an assumption was made that the forward-looking percentage of GR-303 over the study period would be 10% of total lines. The remaining percentage of DLC would be TR-008. As explained in more detail in the discussion of switching later in this testimony, most digital switches deployed in Verizon VA's network are TR-008-compatible, not GR-303-compatible. Verizon VA does not expect that to change in the foreseeable future. Moreover, Verizon VA has not found it economically efficient to deploy significant quantities of GR-303 loops. Thus, as noted, based on Verizon VA's experience, the assumption that 10% of all lines would be served with GR-303 is very aggressive and is forward-looking.

Q. Is the distribution plant analyzed in Verizon VA's cost studies consistent with a modern forward-looking network?

A. Yes. As previously discussed, the FDI and SAI locations in an efficient loop network are selected to economically maximize the portion of the loop length that travels on feeder facilities. The SAI and FDI locations used in the cost studies were derived from the actual Verizon VA network and are fully consistent with these principles. The efficiency of optical loop feeder systems is determined chiefly by the density of the lines in the area served. This is because the RT electronics and supporting structures represent the majority of the cost of optical loop feeder systems. The smallest RT unit that is economically efficient to deploy with existing technology provides capacity for about 224 customer lines. As noted above, when the total line demand is large enough, in locations such as large multi-unit housing complexes, business parks, and malls, it is economically feasible to place an RT at the customer location and entirely eliminate the need for distribution cable. In all other situations, copper sub-feeder and distribution cable is required in the forward-looking model to aggregate enough lines at the RT to make it efficient. The loop models used in Verizon VA's cost studies properly reflect the mixture of optical DLC, copper feeder and sub-feeder, and copper distribution cable required to address efficiently the needs of different areas in Virginia with varying densities.

c) Utilization Factors for Local Loop Components

Q. What utilization factors did Verizon VA use for its loop cost study?

A. Verizon VA assumed the following forward-looking utilization rates for loop facilities: **[VERIZON VA PROPRIETARY BEGINS]** XXX **[VERIZON VA PROPRIETARY ENDS]** for copper feeder and RT common electronics, **[VERIZON VA PROPRIETARY BEGINS]** XXX **[VERIZON VA PROPRIETARY ENDS]** for RT service plug-ins, **[VERIZON VA PROPRIETARY BEGINS]** XXX **[VERIZON VA PROPRIETARY ENDS]** for fiber strand, and **[VERIZON VA PROPRIETARY BEGINS]**

XXX **[VERIZON VA PROPRIETARY ENDS]** for copper distribution cable.

Q. How were these utilization rates determined?

A. All of these utilization rates, with the exception of the utilization rate for service plug-ins, were based on Verizon VA's current utilization rates.

Q. Are the utilization rates based on Verizon's current utilization rates forward-looking?

A. Yes. As discussed above and explained below in more detail, Verizon VA's actual utilization rates for copper feeder cable, RT common electronics, fiber strand, and copper distribution cable reflect the use of sound engineering principles to achieve the most efficient network design. These rates have been stable in Verizon VA's network for years, and there is no factual or theoretical basis to believe that these utilization rates would be different in a forward-looking network. The most significant change in the forward-looking model — the substitution of DLC for copper feeder facilities in a large fraction of the plant — has no effect on utilization for reasons explained below. This is no different from the conclusion that the forward-looking model does not require changing the location of distribution areas within Verizon VA's network, because the forward-looking assumptions do not change the volume and nature of the demand that Verizon VA will serve.

Thus, Verizon VA's actual utilization rates represent the best measure of expected utilization rates in a forward-looking network, and any increase in these utilization rates would come at the expense of increased costs and/or reduced service quality.

i) Copper Feeder and RT Common Electronics

Q. How does Verizon VA calculate the utilization rates for copper feeder cable and RT common electronics?

A. In the context of feeder facilities, utilization is defined as the ratio of (a) the number of loops or loop-equivalents (a copper pair and a DS0 channel on a DLC system supply an equivalent unit of feeder capacity) that the installed feeder capacity can support, to (b) the number of loops or loop-equivalents actually occupied by working customer loops. In the case of the copper feeder, the installed capacity is equal to the number of pairs connected to the feeder side of the FDI. For DLC common electronics (which represent the loop equivalents when using fiber feeder), the installed capacity is equal to the total number of lines that can be supported when all of the installed channel bank shelves in the RT (*i.e.*, the common electronics) are filled with service plug-in cards. For example, each channel bank shelf on the LiteSpan 2000 RT system can support 224 lines. Thus, the total common electronics capacity of a LiteSpan 2000 RT equals the number of installed channel bank shelves multiplied by 224.

Q. Why do copper feeder and RT common electronics have the same utilization rates?

A. DLC technology was specifically designed as a substitute for copper feeder cable. Not surprisingly, a DLC system designed to address the same capacity planning issues that exist for copper feeder facilities has similar characteristics to the copper feeder facilities. Thus, copper feeder and RT common electronics share similar characteristics critical to planning — size of demand served by each facility, capacity unit breakage, and engineering lead time — that contribute to their having the same utilization rates.

The first characteristic shared by copper feeder cable and RT common electronics is the nature of the demand served by each. A feeder route, whether it uses copper or fiber cable, typically serves a large number of subscribers — at times 10,000 or more — and may cover as much as a quarter of the lines in a wire center. For capacity planning, the feeder route is divided into smaller units, called UAAs for copper feeder and CSAs for DLC feeder. UAAs and CSAs are similar in size, usually covering two or three distribution areas and approximately 1,000 access lines. Within each feeder route, installed capacity units are dedicated to a particular distribution area. Thus, an installed copper feeder pair may be placed in a large feeder route structure and planned on the basis of UAAs, but it nevertheless is terminated at a particular FDI cross-box and thus is dedicated to a particular distribution area. Likewise, each DLC equivalent of a copper pair is ultimately dedicated to a particular distribution area.

The second characteristic shared by copper feeder cable and RT common electronics is the engineering lead time required to install additional units of capacity. Feeder facilities are designed with the expectation that they will be augmented over time to accommodate demand growth. Each year an engineer reviews current feeder utilization and forecasted growth on every feeder segment to determine whether demand growth will require a capacity addition on that segment in the coming year. Though the logistics of installing copper feeder cable and RT common electronics are quite different, the planning and installation processes for each require a similar amount of time. Thus, copper feeder cable and RT common electronics are evaluated at similar intervals to determine when additional capacity will be required.

The third characteristic shared by copper feeder cable and RT common electronics is the effect of breakage on the capacity planning process. The task of the feeder engineer during the planning process is to ensure that the capacity of installed feeder facilities will be sufficient to meet the forecasted demand at each distribution area. The standard feeder engineering process used in the industry is referred to as "fill-at-relief" planning. A minimum margin of spare capacity is needed to allow efficient feeder operation, administration and management. Industry operating experience has established this margin as 15% of installed capacity for copper feeder and 10% for DLC feeder electronics. Thus, the maximum experienced utilization at any FDI at any point in time should be 85% for copper feeder and 90% for DLC feeder electronics. The feeder planning process is designed to provide additional capacity before this minimum margin is depleted.

"Breakage" has a similar impact on the planning process for both copper feeder facilities and RT common electronics, further contributing to their similar utilization levels. In the case of copper feeder cable, capacity is most efficiently installed in increments of 100 pairs. Similarly, RT common electronics must be augmented in increments corresponding to physical shelf units that accommodate 224 service channel units. However, as noted, both these facilities must be dedicated to relatively small distribution areas, most of which require a few hundred feeder pairs (whether copper or DLC-derived pairs) in service. Because copper feeder tends to serve distribution areas with approximately half as many access lines as an RT terminal, breakage has a nearly identical effect on utilization levels for both copper feeder and RT common electronics. In both cases, utilization in a particular distribution area drops significantly whenever it is necessary to install additional feeder capacity for that distribution area.

ii) RT Service Plug-In Utilization

Q. What is the relationship between RT service plug-ins (or channel units) and common equipment?

A. Each remote terminal contains two types of electronic equipment: common equipment and service plug-ins. As discussed in the previous section, the common equipment consists primarily of shelf units that have a fixed number of ports (typically 224) for service plug-ins. A "service plug-in" provides transmission and signaling functions (*e.g.*, analog to digital conversion and line power) for a small number of individual lines (eight or fewer). The service channel units represent a significant portion of the DLC cost for each loop. For this reason, they have been designed so that they can be added in small numbers as line demand increases, provided that the installed RT common equipment shelf capacity is sufficient to accommodate additional plug-in cards.

Q. How do the characteristics of service plug-ins affect utilization?

A. Because the service plug-ins — also called channel service units — are relatively easy to install, can be ordered on short intervals, and are available in very small capacity increments, RT service channel capacity is reviewed continuously and additions can be ordered as needed. Normally, additions are sized to last six to 12 months to avoid the added costs associated with having to constantly dispatch technicians to each RT site. For these reasons, it should be possible to maintain the utilization rates for RT service plug-ins at a significantly higher level than the utilization rates for common equipment.

Q. How did Verizon VA calculate the utilization factor for service plug-ins?

A. In this particular case, Verizon VA determined that its current utilization rates were not the best measure of forward-looking utilization rates. Thus, Verizon VA determined the proper forward-looking utilization rates by making appropriate forward-looking adjustments to the maximum theoretical utilization rate for service plug-ins.

Specifically, the maximum theoretical utilization rate for plug-ins at a remote terminal is 90% (this is the same maximum theoretical for common equipment). Average achieved utilization in a forward-looking network would fall below this rate because of the need for sufficient capacity to accommodate short-term growth and demand peaks. Forward-looking utilization also would be affected by the beneficial practice of leaving service plug-ins connected at recently-vacated customer premises. This practice reduces the amount of technician effort (and thus the costs incurred) to reactivate service at that customer premises when a new occupant orders service. Because the duration of a vacancy can be as short as a few days, it may in some cases be more cost-effective to leave service plug-ins connected to a particular distribution pair for a period of time following the disconnection of service.

Based on the experience of Verizon VA's engineers and the characteristics of service plug-ins, Verizon VA determined that an **[VERIZON VA PROPRIETARY BEGINS]** XXX **[VERIZON VA PROPRIETARY ENDS]** utilization factor for service plug-ins represents an appropriate estimate of the utilization of service plug-ins in a forward-looking network.

iii) Fiber Strand Utilization

Q. What is fiber strand?

A. "Fiber strand" refers to all of the fiber optic cable installed in Verizon VA's local exchange network, whether used for feeder facilities or interoffice facilities.

Q. Please describe the characteristics of fiber strand that affect utilization.

A. The fiber cables used in local exchange networks consist of an outer protective tube containing up to several hundred, hair-thin fiber strands. These strands carry the optical signals used by both interoffice and feeder transport systems, and it is not unusual for a fiber cable to supply strands to both feeder and interoffice facilities.

In most fiber cables used in the local network, the fiber strands within the outer protective tube are manufactured in groups of 12 called "ribbons." The group of 12 strands is sealed together in a thin, ribbon-like, plastic casing. This design is economically efficient to manufacture in large quantities, and it also makes handling and deployment in the outside environment easier than working with hundreds of individual, identical loose fibers.

The 12-fiber ribbon structure has a particularly significant impact on the construction and utilization of fiber cable. Existing construction tools and methods make it far easier and more cost-effective to work with fiber cable in whole-ribbon increments. For this reason, fiber is allocated and dedicated by ribbon in most applications. Thus, in the case of fiber cables used for DLC facilities, it is less expensive to allocate to each RT site an entire ribbon of fiber, even though each RT typically requires only four functioning strands. Though this leaves the remaining eight strands unused, thus reduces the utilization rate, the cost associated with trying to divide each ribbon into individual strands and resplice them individually to use at other sites far outweighs the very low incremental cost of the additional fiber strands.

Q. Please provide an example of how the ribbon structure impacts fiber strand utilization on a feeder route.

A. Consider as an example a fiber feeder route serving eight remote terminals at various distances from the central office. Because of the cost savings associated with dedicating a full ribbon to each RT, the feeder route would require a cable emerging from the central office with no fewer than eight ribbons. (On this route, an additional ribbon would be required as administrative spare, making the actual minimum requirement nine ribbons.) Because it is not possible to purchase a cable containing only nine ribbons, the least expensive cable that Verizon VA could purchase for this feeder route would be a 12-ribbon cable (containing 144 individual strands). After connecting one ribbon to each of the eight RTs and then four strands of each ribbon to each RT, a total of 32 strands out of a possible 144 would be in use. This produces a fiber strand utilization factor of 22.22%. (If utilization were measured at the ribbon level, utilization would be eight of 12 total ribbons, or 67.67%.) Even if the particular feeder route permitted using all three of the unused ribbons (assuming one ribbon for administrative spare) for interoffice transport, the resulting strand utilization for that route would be 68 of a total 144 strands, or 47.2%.

Though this example might appear, superficially, to demonstrate inefficiency due to a large amount of wasted fiber strand, the alternative would in fact entail much higher costs. To reduce this spare capacity, it would be necessary to install fiber capacity using either combinations of smaller cable sizes or cable containing individual fiber strands instead of ribbons. Even where such alternative cable sizes or configurations are available, they are not always less expensive than purchasing larger cables containing fibers grouped into ribbons. Moreover, either alternative produces significantly higher installation and maintenance costs, particularly if installation or maintenance requires working with individual fiber strands instead of ribbons. Thus, the mere possibility of a small savings in fiber cable costs would be far outweighed by the high costs associated with installing and maintaining such fiber configurations.

Q. Is there any basis for believing that fiber strand utilization would increase in a forward-looking network?

A. No. The current utilization of fiber strands in Virginia is **[VERIZON VA PROPRIETARY BEGINS]** XXX **[VERIZON VA PROPRIETARY ENDS]**. This rate has been stable for many years, even as Verizon VA has deployed and utilized more fiber. There is no basis to believe this utilization rate would increase in the forward-looking network.

iv) Distribution Cable

Q. What utilization factor was used for copper distribution cable in Verizon VA's studies?

A. A factor of **[VERIZON VA PROPRIETARY BEGINS]** XXX **[VERIZON VA PROPRIETARY ENDS]** was used.

Q. How was this factor derived?

A. This factor is derived from the actual utilization of terminated distribution pairs experienced in the Verizon VA network, with an adjustment for breakage. The copper distribution utilization factor is derived from data extracted from the Loop Engineering Assignment Data (LEAD) database. The LEAD data identifies working, assigned and available pairs in Verizon VA's outside plant. The assigned pairs are classified as F1 or F2. F1 pairs are those which are fed directly from the central office. F2 pairs are those which are on the distribution side of an interface (cross-box).

Q. Why was it necessary to make a separate adjustment to the LEAD data to account for breakage?

A. The utilization of available distribution pairs, as calculated by the LEAD extract, accounts for only those distribution pairs that are connected to the SAI. However, due to breakage (*i.e.*, the fact that distribution cable is manufactured only in certain sizes), it typically is necessary to install cables containing more distribution pairs than actually need to be connected to the distribution terminal. The breakage factor accounts for the fact that a distribution pair requirement may be smaller than the next available cable size. For example, on a distribution backbone route that requires 1,050 lines emanating from the SAI in order to accommodate demand peaks, demand growth, administrative spare, and other factors, the smallest sufficient cable size would be a 1,200-pair distribution cable, leaving a significant number of spare pairs.

The tapering process also contributes some measure of additional breakage that cannot be calculated through the LEAD database. The tapering process allows the use of smaller capacity cables further down a distribution route after a sufficient number of pairs have been branched off from a distribution backbone cable. In the example above, a distribution backbone route that requires a 1,200-pair distribution cable to serve 1,050 lines from the SAI might have two 100-pair branches at each of the first two streets passed by the backbone cable. After passing those branches, only 800 pairs remain to be distributed to the remaining branches. Rather than continue to use a 1,200-pair cable, Verizon VA might use a smaller 900-pair cable to serve the remaining branches, assuming that the cost savings associated with the smaller cable size offset the costs of splicing and connecting the 900-pair cable to the remaining 800 pairs. (The alternative would be to run the 1,200-pair cable to the end of the distribution backbone route and branch off pairs as needed.) This tapering process would produce an additional breakage of 100 pairs that cannot be measured from the LEAD database.

Q. How is the distribution cable utilization factor adjusted to account for breakage?

A. Verizon VA performed an analysis to arrive at a breakage adjustment factor that accounts for the necessary cable size to meet the line requirement. Based on this analysis, Verizon VA made the conservative determination that, on average, breakage in distribution cables required a **[VERIZON VA PROPRIETARY BEGINS]** XXX **[VERIZON VA PROPRIETARY ENDS]** downward adjustment to the distribution cable utilization factor. In the example above, the actual unmeasured breakage would have been 12.5% for the 1,200-pair cable and 16.7% for the 900-pair cable. Thus, the **[VERIZON VA PROPRIETARY BEGINS]** XXX **[VERIZON VA PROPRIETARY ENDS]** adjustment reflects a conservative estimate of the breakage effects that could not be measured using the LEAD data. The breakage adjustment as well as the utilization factor calculations are shown in VZ-VA CS, Vol. I, Part B, Section 5.1.

Q. What other factors account for the utilization rates for distribution cable?

A. A primary driver of distribution utilization rates is the need to accommodate subscribers' needs for multiple lines.

Verizon VA's current experience shows that, across the network, residential subscribers utilize on average 1.18 lines per subscriber location. However, this demand is not spread uniformly over every customer. No customer demands 1.18 lines. Individuals demand one, two, three or even more lines in special cases. Furthermore, concentrations of customers requiring more than one line occur randomly and change over time. To account for these local peaks, industry experience has proven that it is much more economically efficient to build a network with at least two pairs of distribution cables per subscriber to avoid the prohibitive cost and delay associated with installing a new cable each time a group of subscribers on a particular street orders an above-average number of additional lines. Thus, the utilization rate for distribution cable can be explained in large part by the difference between the efficient, forward-looking construction of two (or more) distribution pairs per subscriber and the actual average utilization of 1.18 pairs per subscriber. Other factors such as breakage (discussed above), the need to accommodate future growth, and subscriber churn (which leaves some distribution pairs unused) also contribute to the utilization rate for distribution cable.

Q. Is the distribution utilization factor forward-looking?

A. Yes. The utilization of distribution pairs has been stable in Virginia, and there is no basis to anticipate that it will change significantly in the future based on present or future technological improvements, efficiency gains, or other forward-looking factors. Thus, using Verizon VA's current and past experience to determine the distribution cable utilization factor creates an